3.1 INTRODUCTION

The *Water Demand and Supply Assessment 1985-2025, Prescott Active Management Area* (Assessment) (ADWR, 2011) compiled historical water demand and supply characteristics from 1985 to 2006 for the two groundwater sub-basins that comprise the PRAMA. The report reviewed past conditions and made projections to the year 2025, offering seven scenarios. ADWR conducted the Assessment as preparation for the planning and public interaction that preceded drafting of this *Fourth Management Plan for Prescott Active Management Area* (4MP) as required by the *1980 Groundwater Management Code* (Code). This chapter summarizes and updates the data included in the Assessment and analyzes and identifies the implications of that data.

Water users in the PRAMA depend almost solely on groundwater due to the limited and variable nature of surface water supplies in the PRAMA. The direct delivery and storage of reclaimed water began in the mid-1990s and has increased over time, which has helped to slow the increase in use of groundwater supplies. Annual storage and recovery of surface water began in the year 2000 and has fluctuated on an annual basis with supply availability. For a detailed overview of the geography, hydrology, climate, and environmental conditions in the PRAMA, refer to the *Arizona Water Atlas, Volume 8, Active Management Area Planning Area* (ADWR, 2010).

The proportion of water demand between use sectors has changed significantly in the PRAMA between 1985 and 2012, with the primary change being a transition from the agricultural to the municipal sector. In 1985, agricultural demand accounted for almost 80 percent of the total PRAMA demand, with municipal demand accounting for an additional 18 percent, and industrial demand relatively low. In 1995, agricultural demand had decreased to approximately 62 percent of demand and municipal demand had increased to almost 36 percent of total demand. By 2012, agricultural demand had decreased to only 13 percent of demand with municipal demand increasing to 82 percent. Industrial demands now comprise approximately five percent of PRAMA demands.

In 1948, the City of Prescott began withdrawing groundwater as a supplement to the surface water supply that had been the predominant supply since the city's founding in 1864. By 1975, over 90 percent of the water utilized by the City of Prescott was groundwater withdrawn from the Chino Valley well field. Historically, a significant portion of agricultural demand in the PRAMA was met with surface water supplied by the Chino Valley Irrigation District (CVID). In 1985, approximately 38 percent of the total PRAMA water supply was surface water. Nearly this entire volume was provided by CVID to agricultural use. In 1998, CVID and the City of Prescott entered into an agreement that resulted in replacing surface water deliveries to agricultural users by CVID with delivery of recovered reclaimed water. The surface water rights were transferred to the City of Prescott, who utilizes surface water via annual recharge and recovery. Use of reclaimed water to supply municipal demand also increased over time. In 2012, groundwater remained the primary source of supply, accounting for approximately 82 percent of supply; reclaimed water accounted for 16 percent, with the balance of the supply being recovered surface water.

Figure 3-1 illustrates the trend of agricultural demand decreasing over time and municipal demand increasing in PRAMA. The PRAMA has also seen modest increases in industrial demand, which have stabilized in recent years. Table 3-1 shows the trend in municipal, industrial, and agricultural water use within the PRAMA from 1985 through 2012. Municipal water use expressed in Table 3-1 includes water delivered for non-irrigation uses by a city, town, private water company or irrigation district. Municipal demand is composed of the large provider and small provider subsectors. For purposes of categorizing water demand in the Assessment and in the 4MP, ADWR also includes estimated water demand associated with domestic exempt wells in the municipal demand category. However, ADWR has no regulatory authority over exempt wells. An exempt well is a well with a pump capacity less than 35 gallons per minute. The demand of many individual users, such as turf-related facilities, is also included in the municipal demand since municipal providers often serve them. Agricultural water use in Table 3-1

includes surface water and reclaimed water deliveries by the CVID to individual farms within the PRAMA for all years except for 1990, when groundwater alone was used to meet CVID agricultural water needs. Agricultural demand is composed of the use of water by Irrigation Grandfathered Groundwater Rights (IGFRs) for agricultural uses not on Indian Reservations, and its associated lost and unaccounted for water. Agricultural use is using water to irrigate two or more acres of land to produce crops or feed. Industrial use is a non-irrigation use of water, not supplied by a municipal water provider, including dairies and feedlots and any expansions of those industries. In general, industrial users withdraw water from their own wells that are associated with Type 1 and Type 2 non-irrigation grandfathered groundwater rights, General Industrial Use (GIU) permits or other withdrawal permits. In the PRAMA, industrial demand is composed of the following subsectors: sand and gravel, turf, and other.

FIGURE 3-1
HISTORICAL WATER DEMAND BY SECTOR
PRAMA

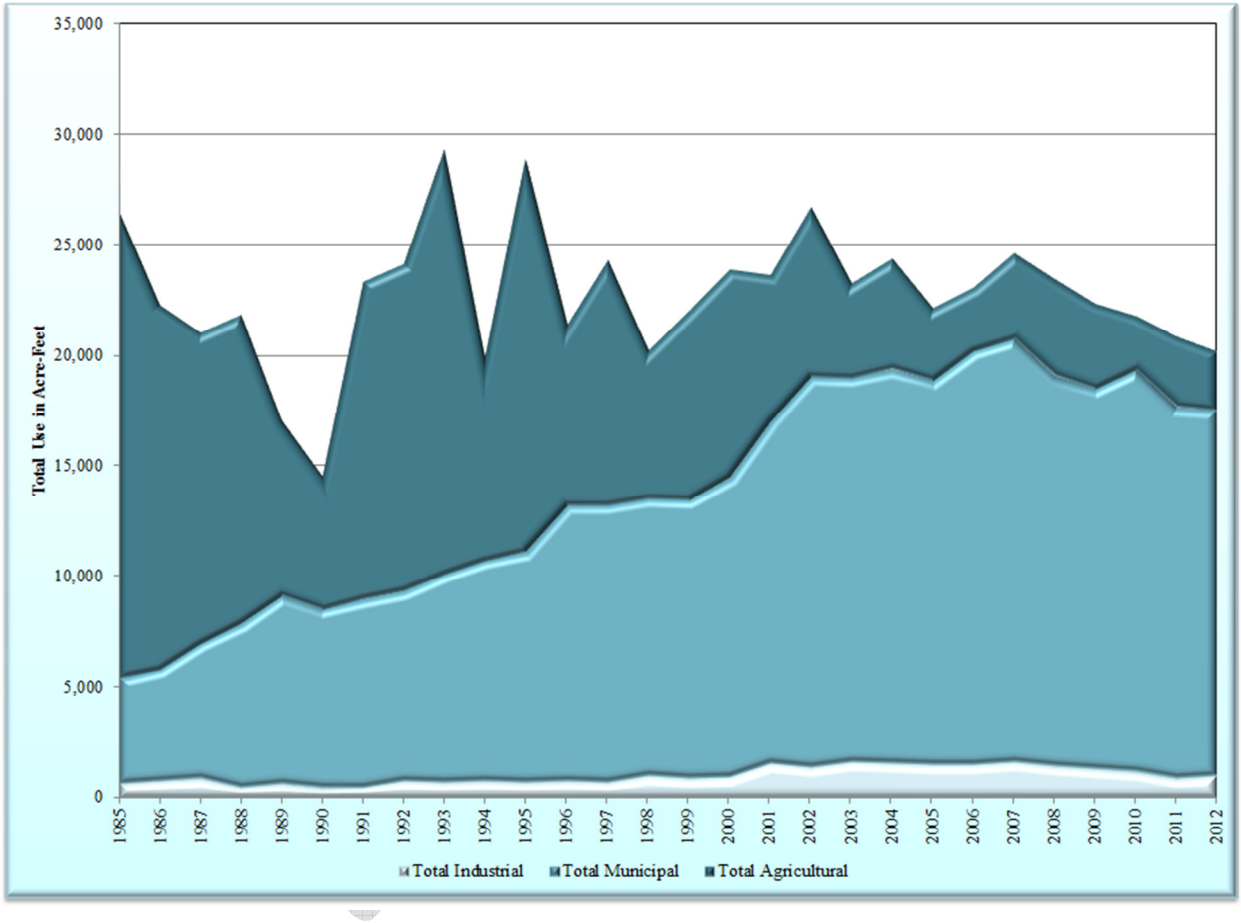


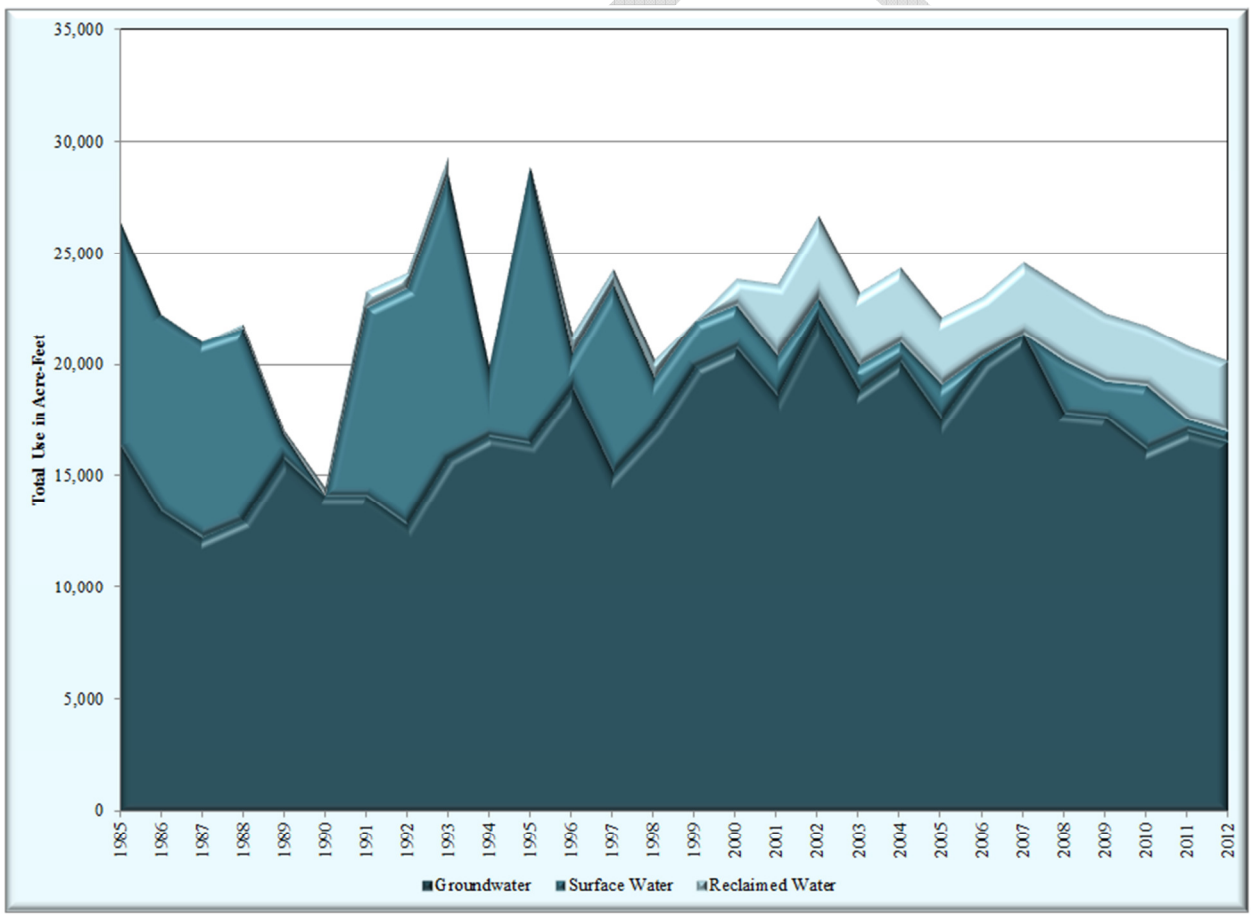
Figure 3-2 shows the sources of supply used to meet demand by all three sectors in the PRAMA during the historical period from 1985-2012. Municipal groundwater demand gradually increased from 1985 to 2007, then, as overall municipal demand declined, so did groundwater use. The reduction in municipal groundwater demand after 2007 corresponds with the economic downturn in those years, although some part of this reduction may be due to conservation. Industrial groundwater demand has been fairly constant while agricultural groundwater demand has declined over time.

Municipal reclaimed water use has increased since 1985 but since 2001 has remained more or less around 2,000 acre-feet per year. No reclaimed water has been used in the industrial sector, while the agricultural

sector has used about 1,500 acre-feet of reclaimed water per year since 2000, due to the transfer of long-term storage credits to the CVID by the City of Prescott.

Surface water use has fluctuated in all three sectors based on the availability of the supply. Since 2000, after the agreement between CVID and City of Prescott was finalized, the City has been annually storing and recovering surface water. During this period, surface water use in the agricultural sector delivered by CVID was discontinued. Outside of the CVID, the Bond Ranch has historically used surface water from Del Rio Springs for agricultural irrigation. The 900 acre-feet of surface water use shown in Table 3-1 for the agricultural sector in 2001 and 2002 was used by the Bond Ranch. The IGFR associated with the Bond Ranch was subsequently converted to a Type 1 Non-Irrigation Grandfathered Groundwater Right and extinguished in 2008. ADWR does not have records of post-2002 surface water use at the Bond Ranch. A small amount of surface water is also used by the industrial sector, at a sand and gravel operation through a surface water claim on Lynx Creek owned by Fain Family LP.

FIGURE 3-2
HISTORICAL WATER SUPPLIES USED
PRAMA



3.2 OVERVIEW OF DEMAND AND SUPPLY BY WATER USE SECTOR

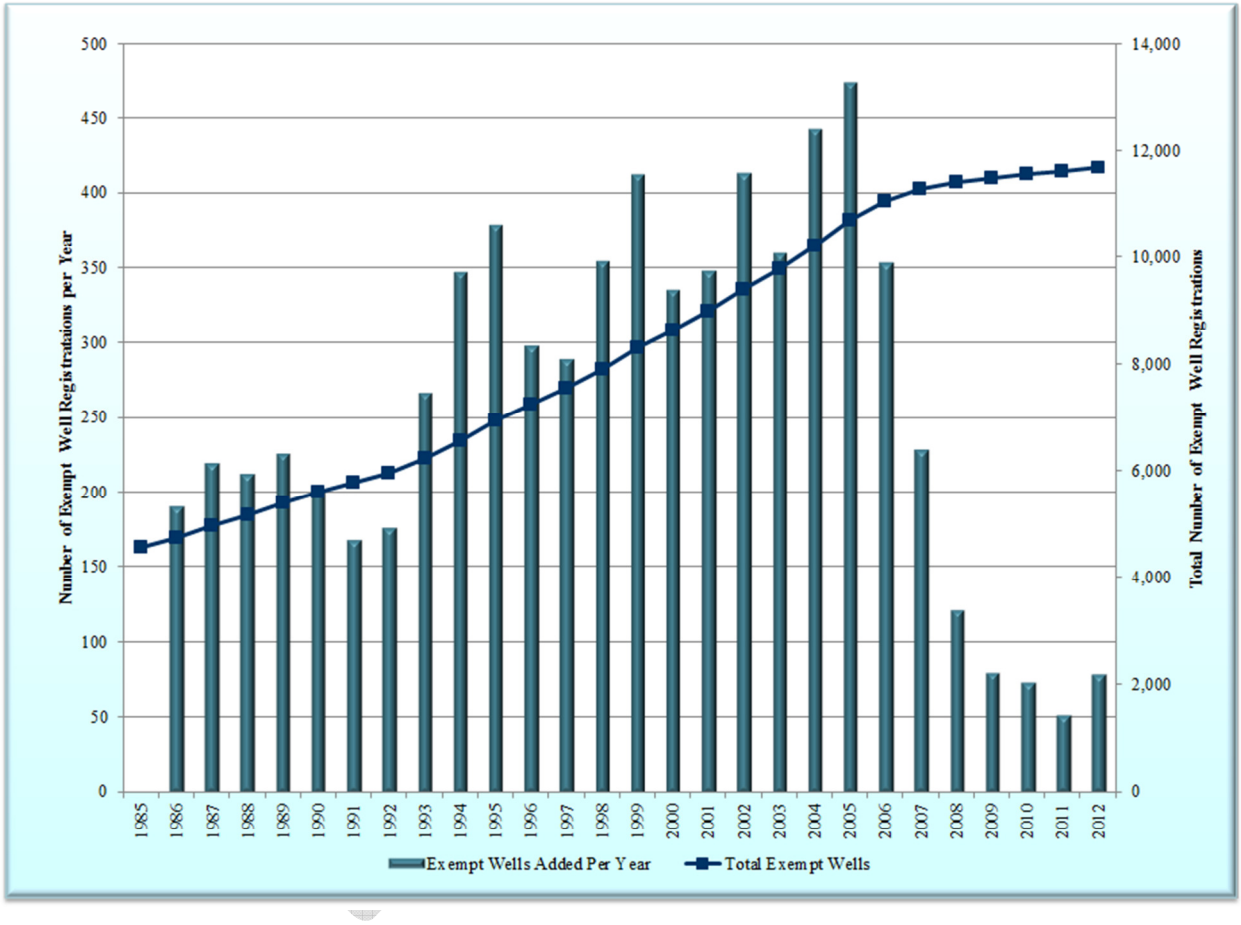
3.2.1 Municipal Sector

ADWR calculated a total PRAMA population of 118,446 persons in 2010 based on disaggregation of the 2010 US Census data. Major communities within the PRAMA include Prescott, Prescott Valley, Chino Valley, and Dewey-Humboldt. The City of Prescott and the Town of Prescott Valley are large municipal water providers. Large provider population was 90,126 persons in 2010. The towns of Chino Valley and

Dewey-Humboldt are small municipal providers. Other small municipal water providers include private water companies regulated by the Arizona Corporation Commission, mobile home parks, and well cooperatives. In 2010, the small municipal provider population was 9,683 people. The remainder of the total PRAMA population in 2010, 18,637 people, is presumed to rely on private, exempt domestic wells for their water. A very small portion of the remainder of the total PRAMA population may haul water.

Since 1985 the number of exempt well registrations in the PRAMA has increased more than 150 percent, from 4,560 exempt well registrations in 1985 to 11,671 exempt well registrations in 2012. From 1994 through 2006 the PRAMA saw very high numbers of Notices of Intent (NOI) to drill an exempt well filed (most of which were completed). Recent numbers of new exempt wells have not re-attained the pre-1994 annual rate of new NOIs (See Figure 3-3).

FIGURE 3-3
HISTORICAL EXEMPT WELL REGISTRATIONS



Between Censuses, ADWR estimates the growth in municipal water provider service areas based on housing units the water providers report as having added to their water service area each year on Annual Water Withdrawal & Use Reports (annual reports). Although occupancy rates and persons per occupied housing unit in each service area fluctuate from year to year, ADWR has historically held these figures constant in the years between Censuses. During the economic downturn, occupancy rates declined which was, in some part, due to foreclosures. Persons per occupied housing unit increased in some areas, which may have been due to extended family condensing into one household, or the number of unrelated persons living in the same household increasing as more people shared a home to reduce individual housing costs. Population can be incorrectly estimated between Censuses as a result of assuming constants for persons per housing unit and occupancy rates. When the decennial Census numbers are

released and disaggregated to the AMA boundary, the AMA population is "benched" to the Census figure, which means that the estimated population for the Census year is replaced with the actual Census count. This appears as a spike or dip in population in the Census year. However, the Census data is correcting for the over- or under-estimation of population that occurred in the years between the Censuses. In 2012, ADWR estimates the population of the PRAMA was 120,969 people, with large providers comprising 90,961 persons, small providers at 9,733 people and the remaining population, 20,274 people, relying on exempt domestic wells for their water supply.

TABLE 3-1
HISTORICAL WATER DEMAND BY SECTOR (AF)
PRAMA

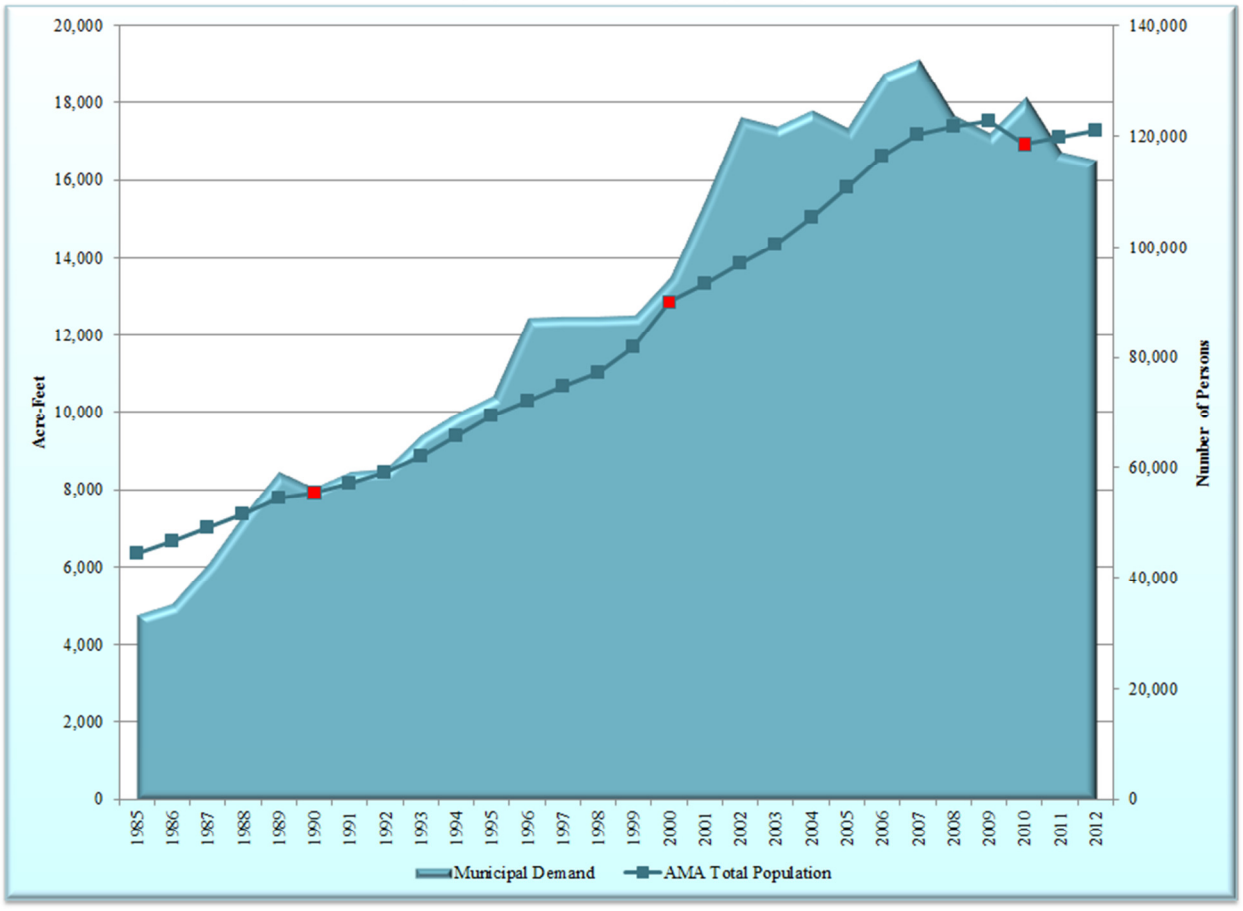
	Municipal			Industrial			Agricultural			TOTAL AMA
Year	Ground-water	Surface Water	Reclaimed Water	Ground-water	Surface Water	Reclaimed Water	Ground-water	Surface Water	Reclaimed Water	
1985	4,579	210	0	641	0	0	11,192	9,795	0	26,418
1986	4,784	276	0	779	0	0	7,913	8,556	0	22,309
1987	5,870	259	0	895	0	0	5,513	8,530	0	21,067
1988	7,066	121	187	523	0	0	5,490	8,460	0	21,847
1989	8,329	0	176	669	0	0	6,794	1,134	0	17,101
1990	7,724	0	344	476	0	0	5,958	83	0	14,585
1991	7,774	0	712	516	0	0	5,861	8,460	0	22,323
1992	7,910	0	650	805	0	0	4,129	10,600	0	24,094
1993	8,666	0	777	704	0	0	6,452	12,720	0	29,320
1994	9,974	0	0	778	0	0	6,027	3,180	0	19,960
1995	10,448	0	0	696	0	0	5,331	12,415	0	28,889
1996	11,627	0	842	796	0	0	6,569	1,580	0	21,415
1997	11,867	0	656	731	0	0	2,597	8,460	0	24,311
1998	11,781	0	738	1,035	0	0	4,342	2,303	43	20,243
1999	12,503	0	47	926	0	0	6,447	2,120	0	22,041
2000	12,694	825	12	967	0	0	7,090	1,155	1,122	23,866
2001	13,147	688	1,667	1,309	241	0	4,167	900	1,499	23,619
2002	15,464	0	2,171	1,411	0	0	5,227	900	1,500	26,673
2003	14,592	1,064	1,729	1,542	66	0	2,754	0	1,500	23,246
2004	15,127	864	1,813	1,541	50	0	3,490	0	1,500	24,384
2005	14,057	1,548	1,752	1,442	54	0	2,091	0	1,211	22,156
2006	16,648	229	1,875	1,360	126	0	2,065	0	782	23,085
2007	17,022	0	2,119	1,562	68	0	2,801	0	1,068	24,639
2008	13,173	2,331	2,152	1,362	63	0	3,256	0	1,103	23,440
2009	13,670	1,569	1,963	1,263	49	0	2,717	0	1,105	22,336
2010	13,466	2,784	1,898	1,153	65	0	1,618	0	837	21,820
2011	13,871	548	2,327	895	30	0	2,260	0	971	20,902
2012	13,909	445	2,163	964	47	0	1,689	0	994	20,210

In the Assessment, ADWR estimated the population that relies on exempt wells for their water by using the average growth rate for large municipal providers between 1985 and 2006. This resulted in the exempt well population being overestimated by approximately 6,000 people by 2010 (comparing the 2010 projected exempt well population in the Assessment scenarios to the Census figure for 2010). However, between the 2000 and 2010 Census, the exempt well population only increased by 1,826 people. The large provider population was overestimated by approximately 13,500 people and the small provider population was overestimated by about 60 people in the Assessment. Figure 3-4 compares the AMA

population with the municipal water demand from 1985 through 2010. The Census years are clearly visible (shown with red markers) when the "benching" occurs and slight dips in the total population seem to occur as the overestimation of population is corrected by the actual Census data.

Due to this overestimation of population in between Censuses, it is difficult to analyze whether individual consumption, expressed in gallons per capita per day (GPCD), was actually increasing or decreasing during this period. Overestimating population results in a downward bias in GPCD figures. A more accurate comparison would be to compare water use in the actual Census years. In 1990, the large provider GPCD rate in the PRAMA was 143 GPCD. The large provider GPCD was 149 and 133, in 2000 and 2010, respectively. Water conservation activities, and the use of new, low water using fixtures, and newer homes with low water using landscapes, result in reductions in GPCD over time. Other factors that affect GPCD are weather conditions and water cost. The low GPCD figure in 2010 could be due to loss of income and subsequent cut back in outdoor watering, as well as possible weather conditions (2010 experienced higher than average precipitation). Multiple factors affect the GPCD rate, making it sometimes an unreliable measure of actual water conservation efforts. However, GPCD can be used as a basic indicator of consumption rates in the absence of more detailed data, such as end-use metering or data-logging, which cost more to collect.

FIGURE 3-4
HISTORICAL MUNICIPAL DEMAND AND TOTAL AMA POPULATION
PRAMA



Clearly municipal demand in the PRAMA has been on a steep growth curve over the historical period, necessitating the need for water managers, including ADWR, to evaluate the continued viability of the groundwater supply and the feasibility and logistics of importing additional water supplies to meet future demands.

3.2.2 Industrial Sector

The Code defines industrial use as a non-irrigation use of water, not supplied by a city, town or private water company, including animal industry use, such as dairies and cattle feedlots, and expansions of those uses. In general, industrial users withdraw water from their own wells that are associated with non-irrigation grandfathered groundwater water rights (Type 1 and Type 2 rights) or withdrawal permits. Although industrial users are primarily dependent on groundwater, some use renewable supplies such as surface water. Historically, industrial uses in the PRAMA included turf related facilities, sand and gravel operations, and other industrial uses such as small landscape users, cooling uses, construction, and others.

Industrial use is largely dependent on population growth and the economy. In some cases, the difference between the actual water use and the total annual allotment at an individual industrial facility is substantial, and is generally a remnant of the allocation process used to establish Type 2 rights. This process assigned users allotments based on the highest annual groundwater withdrawal between the years 1975 and 1980. In 2012, less than 20 percent of the PRAMA's industrial rights and permit volumes were used.

Approximately 48 percent of the total Type 1 and Type 2 allotments in the PRAMA belong to the City of Prescott. One Type 2 right has an allotment of 3,169 acre-feet, and was pledged by the City to the Yavapai-Prescott Indian Tribe (YPIT) in 1995 to guarantee the YPIT water service pursuant to the YPIT Settlement. Consequently, this Type 2 right will likely never be utilized unless the YPIT population grows beyond the City of Prescott's capacity to meet their water needs.

Historically, the industrial sector in the PRAMA has been quite small as compared to the other Active Management Areas (AMAs). Total sector water use in 1985 was 641 acre-feet, or about 2 percent of the PRAMA's total water use. By 1995, it had only grown only to 696 acre-feet. By 2012, total demand was 1,011 acre-feet, which comprised approximately five percent of the PRAMA's total water use. Turf water use and uncategorized industrial use, generally referred to as "other" industrial use currently dominate the AMA's industrial sector. Other industrial uses can include health care facilities, resorts, restaurants, office buildings, shopping malls, and laundries. Although the industrial sector has the authority to grow into its allotment, based on the historical trend of industrial water use in the PRAMA, it seems unlikely that this sector will comprise a much greater share of the total PRAMA demand than it does at present.

3.2.3 Agricultural Sector

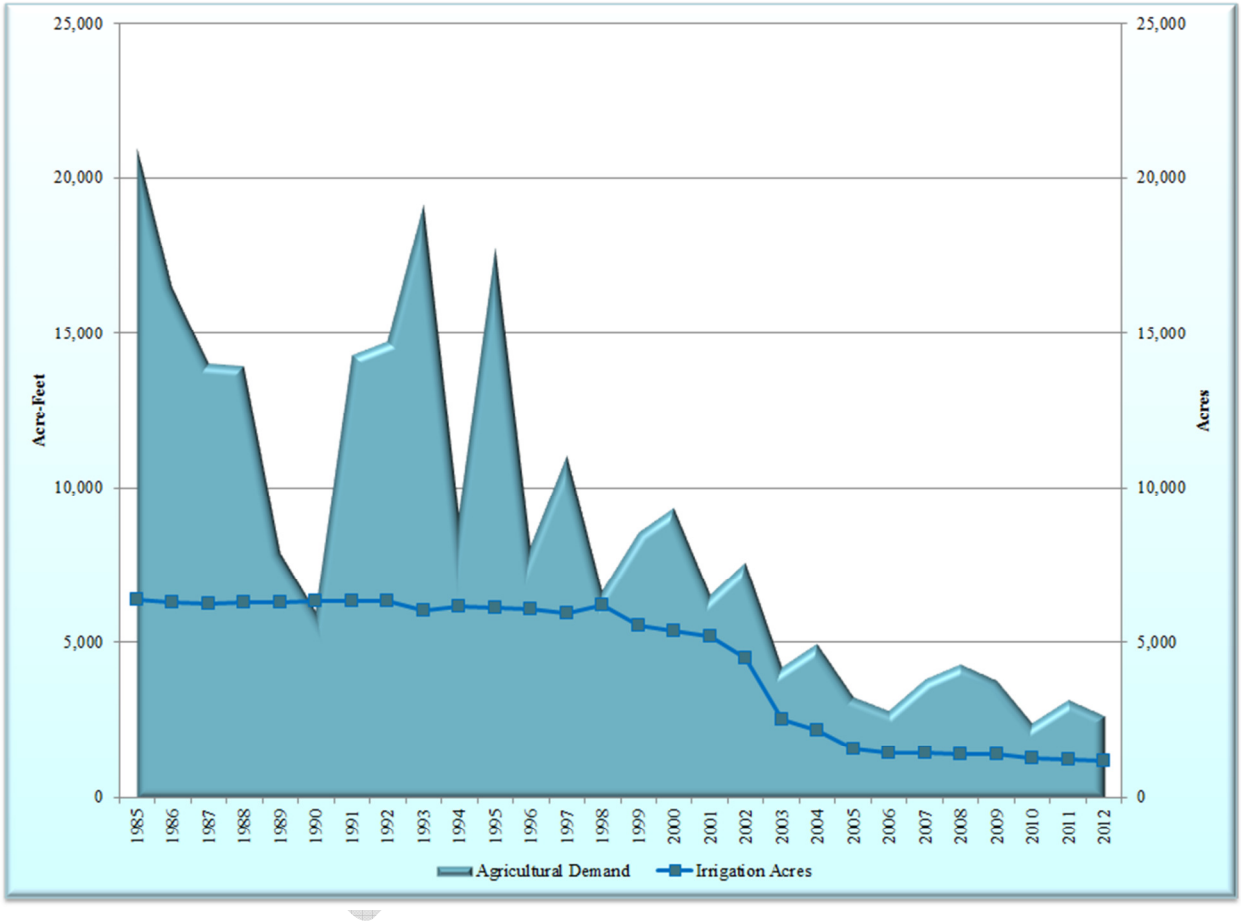
The agricultural sector is comprised of farm acreage actively irrigated with groundwater from 1975 to 1980, and some additional farms that use only surface water. Agricultural lands that used groundwater to irrigate crops during this time period were issued an IGFR by ADWR. Water use pursuant to these rights must be reported to ADWR if the right is larger than ten acres. In the PRAMA, other lands are irrigated exclusively with surface water or reclaimed water recovered within the area of impact of the storage. Such uses are legal without an IGFR, provided that no groundwater is used. People using only surface water or reclaimed water recovered within the area of impact for irrigation purposes are not required to report their annual water use to ADWR.

Historically, agriculture has been a large demand sector in the PRAMA. However, the number of irrigation acres, the number of active IGFRs, and the total allotment for IGFRs decreased significantly between 1985 and 2012. A total of 28 IGFRs associated with 1,142 irrigation acres remain. The sum of the remaining IGFR allotments is 3,966 acre-feet per year. The agricultural sector used approximately 2,683 acre-feet of water from all sources in 2012. Figure 3-5 shows historical agricultural water use from 1985 through 2012 and the total IGFR irrigation acres.

Since 1998, grandfathered rights (GFRs) were partially or fully extinguished pursuant to the Assured Water Supply (AWS) Rules. The AWS Rules allow IGFRs and Type 1 and Type 2 Non-Irrigation

Grandfathered Groundwater Rights (GFRs) to be permanently extinguished to generate credits that can be used to meet the consistency with the management goal requirement of proving a 100-year AWS. This accounts for about 4,200 acres in the PRAMA that can no longer be used for agricultural production. Extinguishment of these rights generated about 176,000 acre-feet of extinguishment credits, of which 12,014 have been pledged to help meet the consistency with management goal criterion under the AWS Rules. The balance, 163,781 acre-feet, remains unpledged. Divided out over a 100 year period, this extinguishment credit volume could result in an additional 1,638 acre-feet per year of new demand consistent with the PRAMA goal. If all the remaining IGFRs and GFRs in the PRAMA were to have been extinguished prior to the end of the year 2012, an additional 92,400 acre-feet of extinguishment credits could have been generated, equating to 924 more acre-feet of new demand per year for 100 years.

FIGURE 3-5
HISTORICAL AGRICULTURAL DEMAND AND IRRIGATION ACRES
PRAMA

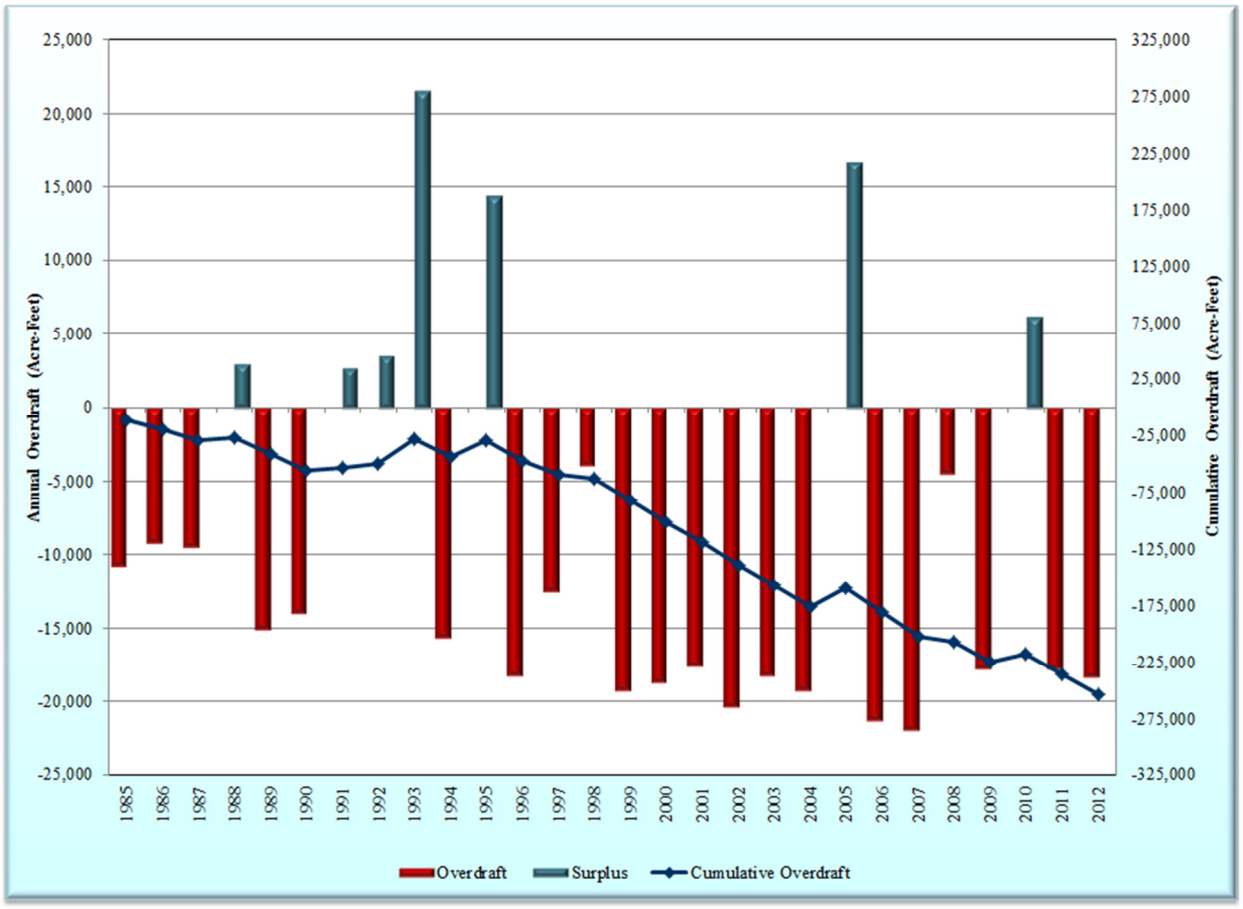


The *Chino Valley Irrigation District* (CVID) is the only irrigation district in the PRAMA. Historical information regarding CVID is somewhat limited because, as a purely surface water district, CVID was not required to report irrigation use to ADWR or its predecessor agencies. The district originally included approximately 2,500 acres of irrigated land (Gookin., 1977). In 1998, CVID entered into an intergovernmental agreement (IGA) with the City of Prescott in which CVID's surface water rights were relinquished to the City. Pursuant to the IGA, all CVID deliveries after 1999 are reclaimed water provided through storage and recovery of reclaimed water. CVID retained a small commitment to serve less than 30 acre-feet of surface water per year to three CVID properties. The maximum annual recovery limit under the IGA is 1,500 acre-feet until a total of 33,000 acre-feet has been recovered. CVID used approximately 3,200 acre-feet of surface water per year from 1985 to 1999. Many CVID shareholders

were issued their own IGFRs and retain the ability to utilize groundwater for irrigation use (or conversion to non-irrigation uses) into the future.

The agricultural sector represents a small portion of the total PRAMA demand and its groundwater demand is similar to that of the industrial sector. Therefore, the impact of the agricultural sector on the PRAMA overdraft is far less significant today and into the future than it has been in the past. Each year between now and 2025, the volume of extinguishment credits that would be generated by extinguishment of IGFRs reduces. When or if the few remaining active IGFRs in PRAMA will be extinguished is unknown. In the Assessment projections, ADWR assumed that 96 acres would remain in production in the year 2025 in Baseline Scenario One, about 600 acres would remain in production in 2025 in Baseline Scenario Two, and 1,400 acres (more than remain today) would be in production in 2025 in Baseline Scenario Three.

FIGURE 3-6
HISTORICAL OVERDRAFT, 1985-2012
PRAMA



3.3 CURRENT WATER BUDGET

The management goal of the PRAMA is to achieve a long-term balance between the annual amount of groundwater pumping and the annual amount of natural and artificial recharge in the PRAMA by 2025 (safe-yield). Net natural recharge and the other components in the calculation of safe-yield are described in the Assessment (ADWR, 2011) in part 3, "The Basic Budget Components." Overdraft, depicted in Figure 3-6 above, is the sum of the groundwater use for all three sectors, minus the sum of the incidental recharge values for the three sectors, plus the additional offsets to overdraft (including net natural

recharge and canal seepage). Red bars indicate overdraft, while blue bars indicate that supplies stored in the aquifer exceeded the volume of water withdrawn and leaving the aquifer through groundwater outflow in that year. The cumulative overdraft between 1985 and 2012 is shown as a line on a second axis. By 2012, the cumulative overdraft in the PRAMA since 1985 was nearly 275,000 acre-feet.

TABLE 3-2
HISTORICAL WATER DEMAND BY SECTOR (AF)
PRAMA

Year	Municipal Demand	Industrial Demand	Agricultural Demand	*TOTAL AMA DEMAND*	Renewable Supplies to Meet Demand[1]	Ground-water to Meet Demand	Offsets to GW Pumping[2]	*OVERDRAFT*
1985	4,789	641	20,987	***26,418***	10,005	**16,413**	5,639	***(10,774)***
1986	5,060	779	16,469	***22,309***	8,832	**13,476**	4,339	***(9,138)***
1987	6,129	895	14,043	***21,067***	8,789	**12,278**	2,793	***(9,485)***
1988	7,374	523	13,950	***21,847***	8,769	**13,078**	16,101	***3,023***
1989	8,505	669	7,927	***17,101***	1,310	**15,791**	732	***(15,059)***
1990	8,068	476	6,040	***14,585***	427	**14,158**	192	***(13,967)***
1991	8,486	516	14,321	***23,323***	9,172	**14,151**	16,882	***2,731***
1992	8,560	805	14,729	***24,094***	11,250	**12,844**	16,443	***3,599***
1993	9,444	704	19,172	***29,320***	13,497	**15,822**	37,334	***21,511***
1994	9,974	778	9,207	***19,960***	3,180	**16,780**	1,182	***(15,598)***
1995	10,448	696	17,745	***28,889***	12,415	**16,475**	30,952	***14,477***
1996	12,470	796	8,149	***21,415***	2,422	**18,992**	838	***(18,154)***
1997	12,523	731	11,057	***24,311***	9,116	**15,195**	2,721	***(12,474)***
1998	12,520	1,035	6,688	***20,243***	3,084	**17,159**	13,261	***(3,898)***
1999	12,549	926	8,566	***22,041***	2,167	**19,875**	737	***(19,138)***
2000	13,532	967	9,367	***23,866***	3,114	**20,752**	2,097	***(18,655)***
2001	15,502	1,550	6,567	***23,619***	4,996	**18,624**	1,051	***(17,573)***
2002	17,634	1,411	7,627	***26,673***	4,571	**22,102**	1,780	***(20,322)***
2003	17,384	1,608	4,254	***23,246***	4,358	**18,888**	231	***(18,657)***
2004	17,804	1,591	4,990	***24,385***	4,227	**20,158**	632	***(19,525)***
2005	17,358	1,496	3,302	***22,156***	4,565	**17,591**	34,366	***16,776***
2006	18,752	1,486	2,847	***23,085***	3,011	**20,074**	-1,170	***(21,243)***
2007	19,141	1,630	3,868	***24,640***	3,254	**21,386**	-415	***(21,801)***
2008	17,657	1,425	4,359	***23,441***	5,649	**17,792**	13,328	***(4,463)***
2009	17,202	1,312	3,822	***22,337***	4,686	**17,651**	-59	***(17,709)***
2010	18,147	1,218	2,455	***21,821***	5,583	**16,238**	22,508	***6,271***
2011	16,746	925	3,231	***20,903***	3,876	**17,027**	-686	***(17,712)***
2012	16,516	1,011	2,683	***20,441***	3,649	**16,563**	-1,664	***(18,226)***

[1] Surface water and reclaimed water
[2] Includes Incidental Recharge and Net Natural Recharge

All Indian uses in the PRAMA are included within the municipal sector. For purposes of the 4MP, overdraft includes use of the groundwater allowance. Despite these volumes of groundwater being consistent with the management goal under the AWS Rules, they are included in the overdraft calculation to allow analysis of the groundwater allowance withdrawal physical impact on the aquifer.

The values in Figure 3-6 differ from those in the Assessment due to water budget hydrologic component updates, discussed previously in Chapter 2. Since publication of the Assessment, (Nelson, 2013), ADWR

has updated its hydrologic groundwater model for the PRAMA and in so doing, increased its previous assumptions regarding the volume of mountain front and stream channel recharge. Further, ADWR groundwater modelers now have a greater understanding of the susceptibility of the PRAMA aquifers to drought and natural recharge. Those updated figures, reflecting actual conditions from 1985 through 2012, are reflected in Figure 3-6. This period of record indicates that the PRAMA has been in an overdraft condition more frequently than it has been in surplus. Values for Figure 3-6 are shown in Table 3-2. The net natural recharge in Chapter 2, Table 2-2 and offsets to groundwater pumping in Table 3-2 do not precisely match. This is due to the way the hydrologic model estimates incidental recharge (from human activities) as opposed to the method of estimating incidental recharge used in the Assessment. However, the figures are fairly close to one another.

FIGURE 3-7
HISTORICAL & AVERAGE NET NATURAL RECHARGE, 1985-2012
PRAMA

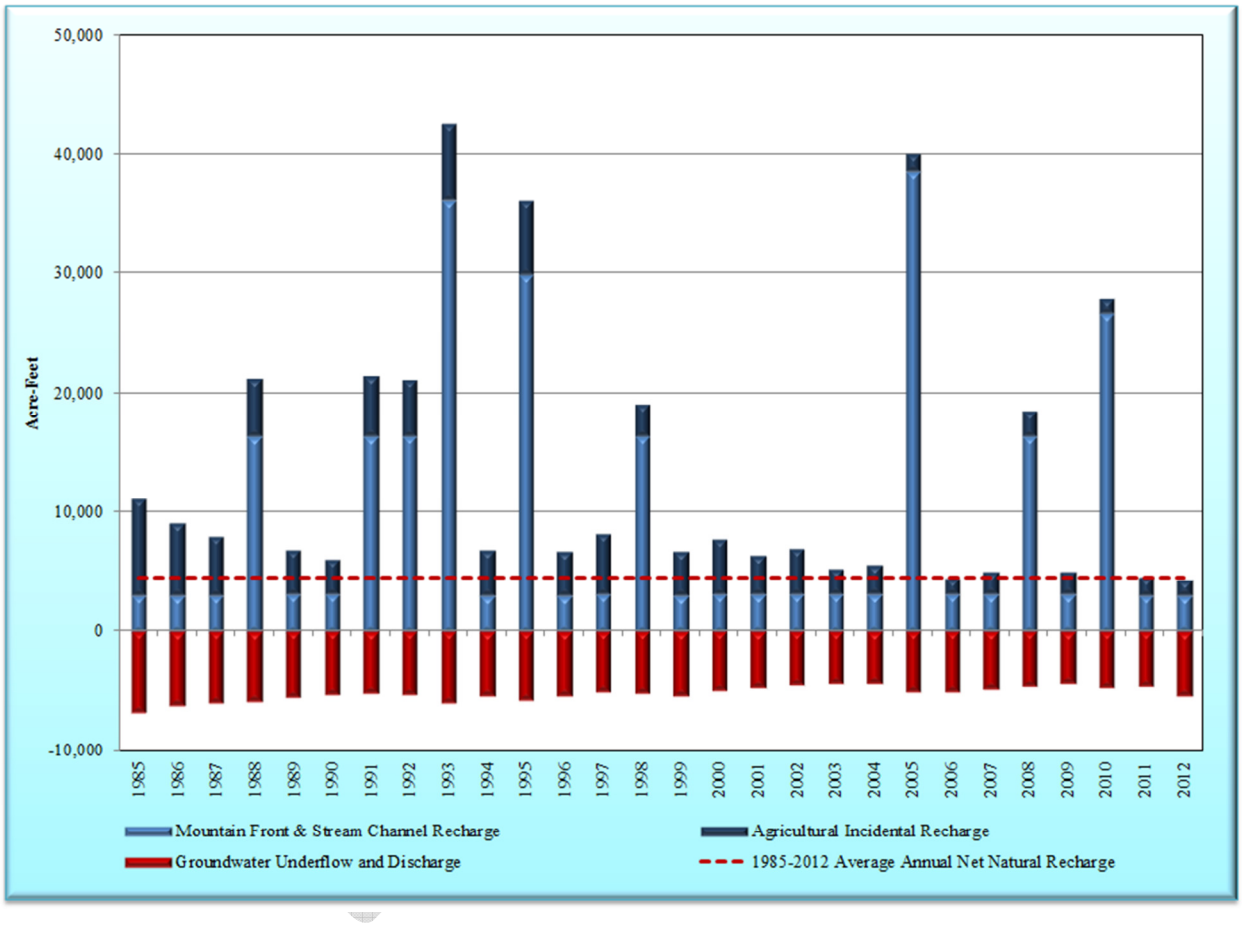


Figure 3-7 charts the net natural recharge components and agricultural incidental recharge figures from 1985 through 2012 and also shows the 1985 – 2012 average for net natural recharge. This figure demonstrates that there are many years when outflow continues despite low precipitation. In addition to the natural components shown in Figure 3-7, human activities also result in recharge of the aquifer. Agricultural incidental recharge is also a component of the aquifer water balance. In years where Figure 3-7 shows more outflow occurring (red bars) than mountain front or stream channel recharge (light blue bars) the additional outflow can be attributed to incidental recharge. In addition, higher rates of outflow may occur for a few years following a year of surplus. In many years the net natural recharge that occurs is below the historical average of approximately 4,400 acre-feet per year, while from time to time a

surplus year is well above the average figure. Thus, use of a long-term average for net natural recharge masks the variable availability non-groundwater natural water supplies from year to year.

3.4 CONCLUSIONS

The water demand characteristics described above, including sources of supply, coupled with the assumption that economic recovery will occur and result in additional population growth and water demands, illustrate that additional water conservation and augmentation programs are necessary in order to achieve the PRAMA goal by 2025. Furthermore, Figure 3-6 and the associated data shown in Table 3-2 give an indication of just how much more effort is needed to achieve the goal. The average annual overdraft in the PRAMA between 1985 and 2012 was about 9,200 acre-feet per year.

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